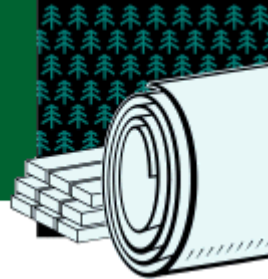


# FOREST PRODUCTS

## Project Fact Sheet



### MARKER-AIDED SELECTION METHODS FOR WOOD PROPERTIES IN LOBLOLLY PINE AND HYBRID POPLAR

#### BENEFITS

- Provides rapid, accurate, relatively inexpensive technique to assay trees
- Applies to trees of any age
- Enhances genetic information on two tree species
- Improves breeding stock of intensively cultivated trees
- Raises quality of wood products
- Decreases production costs for industry through use of superior feedstocks

#### APPLICATIONS

Maps of the quantitative trait loci (QTL) developed for each tree species and other information gained during this project will be published for use by industry scientists.

The new assessment techniques will be applied to industry-wide characterization of wood properties. The research can potentially lead to the genetic engineering of trees with specific properties.



#### Trees with Superior Genes for Certain Wood Properties Will Be Selected To Improve Breeding Stocks and Forest Products

Trees with certain genetic characteristics improve the quality of pulp, paper, and other wood products manufactured from them. For example, a greater cellulose content increases overall pulp yield, the fiber angle and fiber length influence paper strength, and differences in hemicellulose content affect pulp cohesiveness. Forestry researchers are using rapid analytical techniques to analyze wood properties in loblolly pine and hybrid poplars, and to identify the quantitative trait loci (QTLs) or DNA sequences associated with each wood property. These molecular markers will then be used by geneticists in selection and breeding programs to identify desired genotypes in trees of any age.

Until recently, biochemical assays were time-consuming, costly, and often inaccurate, and had to be performed on nearly mature trees. This method will allow analyses to be performed quickly and at low cost, in short-rotation, intensively cultured forests, which are dominated by juvenile wood and low wood densities. The U.S. Department of Energy (DOE) is working with Oak Ridge National Laboratory, the National Renewable Energy Laboratory, the U.S. Forest Service, Weyerhaeuser Corporation, the Institute of Paper Science and Technology, and the University of Washington to help industry select trees with superior genotypes from which to manufacture high-quality wood products.



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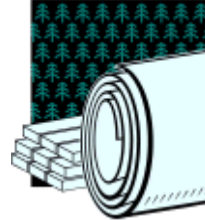
## PROJECT DESCRIPTION

**Goal:** To identify molecular markers in loblolly pine and hybrid poplar trees that are associated with the qualities of wood sought by the forest products industry, and to use the markers in selecting and breeding trees of the desired genotypes.

Two, three-generation segregating species of loblolly pine and two, three-generation F2 pedigrees of hybrid poplar are available for use in this study. Using molecular maps already developed for these pedigrees, researchers will identify QTLs for the desired wood properties. Wood samples will be assessed for their physical and chemical composition, and existing analytical techniques (e.g., X-ray densitometry, molecular beam mass spectroscopy) will be used on the two tree species in combination with the marker-aided selection process. After the parental and F1 generations are screened for the desired wood properties, a single pedigree will be chosen for further analysis. Following initial mapping efforts, experiments will be conducted to validate QTLs and select molecular markers for the desired traits.

## PROGRESS & MILESTONES

- Researchers have identified 28 QTLs at 11 positions in the loblolly pine genome that are associated with wood properties.
- Each QTL identified explains 7-15 percent of the variations within a given wood property.
- Several QTLs cluster into identical positions within the genome, e.g., at linkage position 8, there are 7 QTLs that co-localize to the same position.
- The next step is validation of estimated positions within the genomes of the loblolly pine and hybrid poplar for genes that control wood properties.
- Isolation of gene sequences that control wood properties is a future task.
- Superior hybrid poplars are being grown by the Boise Cascade Corporation in Clatskanie, Oregon.



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